REMARKS

Claims 1 and 3-58 are pending in this application. Claims 20-56 are currently withdrawn. By this Amendment, claims 1 and 20 are amended. Specifically, claims 1 and 20 are amended to recite "wherein 50% or more of the cross-linked sites are identical." Support for the amendments can be found at least at page 64, lines 12-20 of the specification. No new matter is added.

Rejections Under 35 U.S.C. §103(a)

The Patent Office asserts three separate rejections of claims 1, 3-19, 57 and 58 under 35 U.S.C. §103(a). Those rejections are as follows:

(1) Tsukamoto (U.S. Patent No. 7,282,742) in view of Lavin (U.S. Patent No. 6,426,134);

(2) Tsukamoto in view of Niu (High Power Electrochemical Capacitors Based on Carbon Nanotube Electrodes, Appl. Phys. Lett. 70(11), March 17, 1997); and

(3) Tsukamoto in view of Tour (U.S. Patent No. 7,250,147).

Each of the rejections relies upon Tsukamoto as the primary reference. Therefore, the rejections will be addressed together below.

Claim 1 is directed to an electronic device comprising three or more electrodes in a transporting layer. The transporting layer comprises a carbon nanotube structure comprising a plurality of carbon nanotubes and cross-linked sites on the carbon nanotubes. 50% or more of the cross-linked sites are identical, and are comprised of a hydrocarbon having 2 to 10 carbon atoms or formed by functional groups of the carbon nanotubes bonded to each other directly as the cross-linked sites.

In normal condensation polymerization, a reaction progresses by removing water or alcohol from a system in which multiple monomers exist. However, even when carbon nanotubes having functional groups are contained in the system, it is practically impossible

that the carbon nanotubes are taken into the reaction. If the system reacts with the carbon nanotubes, such a reaction scarcely occurs, and the probability of obtaining the state of cross-linking of the carbon nanotubes to each other becomes further lower. The cross-linked sites between the carbon nanotubes are mainly formed of the condensation-polymerizable monomers, and all the cross-linked sites have a random structure even if the multiple cross-linked sites exist.

In the electronic device and methods of the instant claims, the monomers are carbon nanotubes having functional groups, and hence 50% or more of the cross-linked sites can be made to have the identical structure by appropriately controlling the structure of the functional groups, the cross-linking agent, the cross-linking method and the like.

Tsukamoto, as discussed at page 5, lines 10-24 of the instant specification, describes an organic semiconductor material in which carbon nanotubes are dispersed in a conjugated polymer, with the weight fraction of the carbon nanotubes being 3% or less, relative to the conjugated polymer. The dispersion method utilized in Tsukamoto results in very little contact between carbon nanotubes, thus resulting in low electrical conductivity. Various passages in Tsukamoto (see, for example, column 3, lines 28-30 and 40-44; column 7, lines 14-19) describe that the carbon nanotube amount in the layer must be limited to 3% or less, so that the carbon nanotubes may be dispersed in the polymer substantially without contacting each other, thus avoiding the formation of conductive paths. Tsukamoto thus requires that the carbon nanotubes be substantially free of contact with each other, thus the number of contact points between the cross-linked structures, to the extent present, is small. Nowhere does Tsukamoto describe a carbon nanotube structure wherein 50% or more of the cross-linked sites of the structure are identical.

The Patent Office alleges that one of ordinary skill in the art would have found it obvious to have replaced the semiconductor layer of Tsukamoto with a layer including a

cross-linked structure of carbon nanotubes as allegedly described by Lavin, Niu or Tour. However, such a combination would not have been made, as contrary to Tsukamoto, but even if made would not have led one to the device and method of the present claims.

With respect to Lavin, it is described therein that a polymer of a large excess of a diamine and a carboxylic acid is used, resulting in a low ratio of random cross-linked sites. The Examples describe carbon nanotubes as copolymers with, for example poly(trimethylene terephthalate) and poly(ethylene terephthalate). Cross-linking of such copolymers would result in extremely long cross-linking sites, which would necessarily differ in length. Lavin thus describes a carbon nanotube structure with random cross-linked sites, and does not describe a carbon nanotube matrix wherein 50% or more of the cross-linked sites are identical, and are comprised of a hydrocarbon having 2 to 10 carbon atoms or formed by functional groups of the carbon nanotubes bonded to each other directly as the cross-lined sites, as required by claim 1.

Regarding Niu, it is described therein that carbon nanotubes may be modified by introducing oxygenate groups onto the surface thereof, and then dispersing the carbon nanotubes in water, filtering and drying followed by thermally cross-linking to form a rigid carbon nanotube electrode. Niu describes the electrode so-formed as consisting of randomly entangled and cross-linked carbon nanotubes (p.1481). Nowhere does Niu describe a carbon nanotube structure wherein 50% or more of the cross-linked sites are identical, and are comprised of a hydrocarbon having 2 to 10 carbon atoms or formed by functional groups of the carbon nanotubes bonded to each other directly as the cross-linked sites, as required by claim 1.

Regarding Tour, it is described therein that carbon nanotubes may be modified to include a diazonium species (abstract; column 2, lines 59-63; Examples). Nowhere does Tour describe a carbon nanotube structure wherein about 50% or more of the cross-linked

sites are identical, and are comprised of a hydrocarbon having 2 to 10 carbon atoms or formed by functional groups of the carbon nanotubes bonded to each other directly as the cross-lined sites, as required by claim 1.

Further, none of Lavin, Niu or Tour would have directed one of ordinary skill in the art to have combined Tsukamoto with Lavin, Niu or Tour because one of ordinary skill in the art would have recognized that the combination would have rendered the semiconductor element of Tsukamoto unsuitable for its intended purpose. Specifically, Tsukamoto describes that contact between the carbon nanotubes must be minimized in order for the layer to function as a semiconductor layer. Including substantially cross-linked structures in the layer (10) of Tsukamoto would render the layer unsuitable for use as a semiconductor as intended in Tsukamoto. Thus, one of ordinary skill in the art would not have had any reason or rationale to combine Tsukamoto with any of Lavin, Niu or Tour.

Applicants therefore respectfully submit that claim 1 is not obvious over Tsukamoto in view of Lavin, Niu or Tour. Because claims 3-19 depend from claim 1 and include all limitations thereof, claims 3-19 are also patentable over Tsukamoto in view of Lavin, Niu or Tour for at least the same reasons.

Rejoinder

Claims 20-56 are currently withdrawn. Pursuant to M.P.E.P. §821.04, Applicants respectfully request that upon allowance of claim 1, claims 20-56 be rejoined and allowed, because the withdrawn claims include all of the features of claim 1.

Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1 and 3-58 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

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